

Maternal deaths in Bloemfontein, South Africa — 1986 - 1992

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Objective. Determination of the maternal mortality ratio and the main causes of maternal death.

Setting. Pelonomi Hospital, a tertiary care and referral hospital in Bloemfontein.

Methods. Review of prospectively completed structured questionnaires on all maternal deaths from 1986 to 1992.

Results. The maternal mortality ratio at our institution was 171 per 100 000 live births. Haemorrhage (25%), infection (24%) and hypertensive disease (18%) were the most important causes of death. Seventy-one per cent were direct obstetric deaths and 23% indirect; in the remaining 6%, the cause was uncertain. Of all deaths, 35% were considered preventable.

Conclusions. The maternal mortality ratio has decreased since our previous report for the period 1980 - 1985, and haemorrhage has replaced infection as the leading cause of death.

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The World Health Organisation estimated that approximately 99% of the 500 000 deaths per annum from pregnancy- and childbirth-related causes occur in developing countries. In the early 1980s the average maternal mortality ratio was 450 deaths per 100 000 deliveries in developing countries, compared with an average of 30 per 100 000 in developed countries. Although the majority of maternal deaths occurred in Asia, the risk of maternal mortality was highest in sub-Saharan Africa. In Africa the ratio varied between 500 and 700 deaths per 100 000 deliveries.^{1,2} In South Africa, published maternal mortality ratios (per 100 000 deliveries) varied between 48 (in a survey of 267 hospitals from 1980 to 1982), 192 (according to government statistics and several studies from Cape Town and Durban between 1971 and 1982) and 550 (in KwaZulu/Natal between 1972 and 1982). The KwaZulu/Natal study was the only community-based study of maternal mortality in South Africa. At Pelonomi

Hospital, Bloemfontein, one of our own academic hospitals, the ratio was 287 per 100 000 deliveries for the period 1980 to 1985.³

From the aforementioned figures it is clear that the maternal mortality ratio is a very important health parameter, particularly in developing countries. The objective of this study was to re-evaluate the maternal mortality ratio in Bloemfontein and, where possible, determine the cause of the maternal deaths.

Patients and methods

Bloemfontein is the largest centre in the Orange Free State, one of South Africa's nine provinces. All non-private patients who receive hospital-based antenatal care in Bloemfontein deliver under the supervision of the Department of Obstetrics and Gynaecology, University of the Orange Free State.

Detailed reports, based on a structured questionnaire, are completed for every maternal death. Reports for the period 1986 to 1992 formed the database of this analysis. Data were analysed with the aid of descriptive statistics.

This study was approved by the Ethics Committee for Medical Research of the University of the Orange Free State.

Results

During the period 1 January 1986 to 31 December 1992, 91 women, 24 (26%) of whom had delivered elsewhere, died in Pelonomi Hospital as a result of pregnancy or childbirth. The maternal mortality ratio for women delivering at our hospital was 171 per 100 000 live births. Of the women who died, 75% had been referred to Bloemfontein for specialised medical care and only 26% had attended antenatal clinics, either at Pelonomi Hospital or elsewhere. The duration of pregnancy at the time of death was less than 24 weeks in 4 cases (6%), 24 - 28 weeks in 10 cases (14%), 29 - 36 weeks in 29 cases (41%) and more than 36 weeks in 27 cases (39%); it was unknown in 21 patients. Of the 73 patients with known parity at the time of death, 4% were nulliparous, 40% para 1, 42% para 2 - 4 and 14% para 5 or more. The ages ranged from 14 to 43 years, with a mean of 27 years and a median of 26 years.

The outcome of the pregnancies in the study group was known in 84 (92%) cases: 46 livebirths (55%), 26 stillbirths (31%), 5 abortions (6%), 1 ectopic pregnancy (1%) and 6 maternal deaths with the fetus *in utero* (7%). The perinatal mortality ratio for these patients was 590 per 1 000 deliveries (calculated for a birth weight of 500 g and more, up to 7 days after birth).

The main causes of maternal death are listed in Table I. In each case the cause was classified as either a direct or an indirect obstetric death. Postmortem examinations were performed on 31 women; in 50 cases no postmortem was performed and in 10 it is unknown whether one was performed. Direct obstetric causes accounted for 71% of the maternal deaths. A thorough review of probable causes of death revealed that 35% of deaths could have been prevented. Factors which could have contributed to the maternal deaths are listed in Table II. Furthermore, the main

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causes of death were cross-tabulated with several variables (Table III). All the women who died of hypertensive disease and associated conditions delivered at our institution, while patients who delivered elsewhere more often died of infection.

Table I. Causes of maternal deaths

Cause	No.	Obstetric association			%
		Direct	Indirect	Unsure	
Haemorrhage					
DIC	5				
PPH	9				
Other	9				
Total	23	18	4	1	25
Infection					
Septicaemia	22	19	3	0	24
Hypertension					
Pre-eclampsia	1				
Eclampsia	10				
Unclassified	1				
Other	4				
Total	16	13	2	1	18
Embolism					
Amniotic fluid	1				
Pulmonary	5				
Total	7	4	2	1	8
Other					
Lung complications	4				
Heart complications	8				
Multiple organ failure	7				
Other	3				
Unknown	1				
Total	23	11	10	2	25
Total	91	65	21	5	100

DIC = diffuse intravascular coagulation; PPH = postpartum haemorrhage.

Table III. Cause of death and some independent variables

Variable	Cause of death				Total
	Haemorrhage	Infection	Hypertension	Other	
Parity (N = 73)					
0-1	4	11	6	11	32
≥ 2	15	8	4	14	41
Age (N = 87)					
< 30 years	12	14	9	20	55
≥ 30 years	10	7	5	10	32
Outcome of pregnancy (N = 84)					
Live	11	10	8	17	46
IUD	7	5	6	8	26
Other	2	4	2	4	12
Antenatal clinic attendance (N = 48)					
Yes	5	5	3	11	24
No	3	9	6	6	24
Place of delivery (N = 78)					
Bloemfontein	11	8	14	21	54
Elsewhere	9	10	0	5	24

IUD = intra-uterine death.

Table II. Preventable factors which contributed to death

Factor*	Our institution (N = 44)	Other hospitals (N = 49)
Inappropriate treatment	12	10
Unbooked status	11	20
Delay in treatment	11	10
Delay in diagnosis	9	5
Late referral	7	23
Surgery undertaken too late	7	4
Over-transfusion	6	—
Late booking	2	3
Surgery not undertaken	1	3
Inappropriate surgical procedure	1	3
Anaesthetic complications	—	—

*More than one factor could be present in a specific case.

Discussion

For the purpose of this study a maternal death was defined according to the *International Classification of Diseases (ICD 9 and 10)* as 'the death of a woman while pregnant or within 42 days of termination of the pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes'.¹ Maternal deaths can therefore be subdivided into either direct or indirect obstetric deaths. In some reports, the period of observation after the delivery was extended to 'more than 42 days', '90 or 120 days' and even 'up to 1 year'.⁴⁻⁷ The term 'pregnancy-related deaths' has been suggested instead of 'maternal mortality' for use in those cases where the cause of death cannot be identified precisely.¹ The true maternal mortality rate is reflected in the relationship between the number of maternal deaths and the number of women of reproductive age (15 - 45 years) in a given time frame. The maternal mortality ratio, however, has as denominator the number of pregnancies of which the number of livebirths during a specific period is assumed to be a good proxy indicator. In this study, we used the ratio to standardise the number of maternal deaths.

Maternal deaths as a measure of health can also be expressed by other definitions. The 'reproductive mortality rate' includes deaths due to complications of pregnancy, induced abortion and contraception among women of reproductive age.⁸ This is a more sensitive indicator of reproductive health than maternal mortality. More recently, the term 'pregnancy-related death' was introduced and defined in the 10th revision of the *International Classification of Diseases*. All causes of death (pregnancy-related or not) are taken into account up to 42 days, or in the case of a 'late maternal death' up to 1 year, post-termination of pregnancy.⁴

Our maternal mortality ratio of 171 per 100 000 livebirths is lower than the previously reported 287.³ One reason for this reduction is the difference in method of calculation. In the previous report, all maternal deaths were taken into account, while this report records only those patients delivering at our hospital. A second reason may be the establishment in 1988 of a special care unit for high-risk pregnant and postpartum women.

In addition to improving and expanding antenatal services, several strategies for decreasing maternal mortality have been described, e.g. the establishment of maternal and child health networks, the erection of waiting homes for pregnant mothers close to a medical facility, improved education of pregnant women and the recognition and training of traditional birth attendants (TBAs).⁸ However, the three most important measures for decreasing the number of maternal deaths have been the introduction of blood transfusion services, the use of antibiotics and the availability of emergency caesarean section services.⁸⁻¹⁰ In the Orange Free State, the expansion of antenatal services, recognition and training of TBAs and the erection of waiting homes in certain areas should receive urgent attention if the maternal mortality ratio is to be lowered.

The main causes of maternal death in developed countries differ from those in developing countries. In developed countries, the most important cause is embolism, followed by ectopic pregnancy, hypertensive disease and haemorrhage.^{6,7,10} The three most important causes in developing countries, however, are infection (often related to obstructed labour), hypertension and haemorrhage (particularly postpartum haemorrhage).^{1,2,8,9} In this study, haemorrhage (25%) was the most common cause, followed by infection (24%) and hypertensive disease (18%), while in our previous report covering 1980 - 1985, the three most common causes were infection (46%), hypertensive disease (21%) and haemorrhage (14%). It is not clear whether this change reflects a true rearrangement of aetiological factors as the method of data collection differed between the two studies.

General agreement exists that most studies on maternal mortality underestimate the magnitude of the problem.^{11,12} A community survey is recognised as the best method of determining the maternal mortality rate.^{11,13} In South Africa, all published data on maternal mortality are from hospital-based studies except for the one community-based study in KwaZulu/Natal.¹ Our data, being hospital-based, are not a true reflection of the actual state of affairs. A need exists for properly designed community-based studies, which certainly is a challenge for the future. Furthermore, maternal mortality should be viewed as a health priority in this country and a national strategy is urgently needed for decreasing the number of pregnancy-related maternal deaths.

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